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Head injuries in Papua New Guinea

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SUMMARY

Head injuries are the commonest cause of death in the surgical wards in Port Moresby and the commonest cause of death in road accidents. Three prospective and retrospective studies performed over the last decade aimed to determine the pathology and outcome in 274 head injuries admitted to Goroka in 1988-1991 (4 years) and Port Moresby in 1984-1985 and 1992-1993 (total 2.5 years). Head injuries were managed by general surgeons without CT scanning or intracranial pressure monitoring. There were 196 adults and 78 (28%) children; 195 were male and 79 female. Assaults (32%), motor vehicle accidents (49%) and falls (17%) were the commonest modes of injury. The case fatality rate was 21% (57 of 274 cases). Six of the deaths were avoidable. The fatality rates for admission Glasgow Coma Scores of 3-5, 6-8 and over 9 were 81%, 21% and 3% respectively. Two patients died of infection complicating open depressed fractures. The case fatality rate for extradural haematoma was 20% and subdural haematoma 67%. Nine patients died of associated abdominal injuries. Most of the deaths were unavoidable because of the severity of primary brain injury. The speed of diagnosis and quality of care could have been improved but the most important area is management of the airway. General surgeons properly trained in trauma care (which includes emergency airway management) are well able to cope with the majority of head-injured patients in Papua New Guinea.

Case History

An 8-year-old Melanesian girl was struck on the right temporal area by a thrown beer bottle. After the injury she was fully conscious for 2 hours and then fitted. At this point she was brought to Casualty, where she was found to be in status epilepticus and required 3 ml of paraldehyde to stop the fit. An initial attempt at intubation induced vomiting of thick vomitus and she was managed on her side to protect the airway. Two further fits ensued in the next hour, which were stopped by 5 mg and 10 mg of diazepam respectively. She was intubated and had skull radiographs taken which showed no fracture. Throughout this period she remained unconscious with a Glasgow Coma Score (GCS) of 9, had equal and reacting pupils which were small except during the fits, and moved all four limbs. The child was then transferred to the Intensive Care Unit (ICU) and observed. It was felt that her conscious level might improve after the effects of the diazepam wore off. She was commenced on prophylactic phenytoin and allowed to breathe spontaneously with oxygen added to the endotracheal tube. Throughout the next four days the child made little progress except that she was extubated. She developed no localizing signs. It was noted on day four that she had a right abducens palsy but the parents stated that she had been like that since birth (labour took 48 hours). On the fifth day of admission she was taken to theatre for diagnostic burr holes on the grounds that she was failing to improve and that the parents might be confusing a squint with the right abducens palsy. A right subdural haematoma was drained and the underlying brain was oedematous although the dura could be closed. Thereafter the child's conscious level improved slowly and she was discharged home with a minimal neurological deficit although the abducens palsy did not improve.

This case illustrates some of the difficulties

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with the management of head injury in PNG both in terms of airway management and the decision when to perform burr holes to explore for haematoma. The management of the case was not ideal but the outcome was good. The next similar case had burr holes performed at 24 hours for a dilating pupil but on this occasion only oedematous brain was found.

Introduction

Head injuries are a common cause of surgical admission throughout Papua New Guinea (1,2) and elsewhere in the tropics (3,4). In Papua New Guinea they are the commonest cause of death from trauma, two-thirds of which occur before the patient reaches hospital (1,5). Head injuries are also responsible for 60% of all trauma deaths after admission. In Australia, as in other developed nations, the management of a severe head injury in country hospitals includes a computerized tomography (CT) scan to help determine the actual pathology (6). Cases requiring surgical intervention can be transferred to the care of a neurosurgeon in the cities where 80% of the population resides. In contrast, 80% of the population of PNG lives in the rural areas and neurotrauma must be managed by general surgeons without the benefit of CT scanning. The situation is similar in most other developing countries (7). Before admission to hospital there will be little skilled airway management to prevent secondary brain damage from hypoxia because ambulance services are limited even in major towns such as Port Moresby, Lae and Goroka.

The aim of this study was to obtain an audit on the pathology and outcome of head injuries admitted to two major centres in PNG. The information would be used to determine the need for further developments in neurosurgery.

Methods

Three studies were performed. The first was in Port Moresby in 1984-1985 (PC), the second in Goroka in 1988-1991 (OL) and the third in Port Moresby in 1992-1993 (OL and JVR). The information was collected prospectively except for patients in Goroka between 1988 and 1990. The autopsy rate was low, being 15 of 57 deaths (26%).

Results

Patients, age and sex (Table 1)

The incidence of head injury admissions per year was 60-70 in Port Moresby and 25-30 in Goroka. Over a quarter were children less than 12 years. The male to female ratio was 2.5.

Mode of injury (Table 2)

Head injury admissions were most often due to motor vehicle accidents (MVAs) in Goroka and, overall, in Port Moresby, though assaults have become slightly more common in Port Moresby in the 1990s as a cause of admission. However, MVAs were the most common cause of death from head injury in Port Moresby.

Head injury fatalities (Table 3)

Of 57 head injury deaths 6 (11%) were potentially avoidable. The reasons were either that the patient was sent home from Casualty instead of being admitted or that there was failure to secure the airway.

Outcome by severity

The outcome correlated with the admission Glasgow Coma Score (GCS), the case fatality rate being 81%, 21% and 3% for GCS 3-5, 6-8 and 9-15 respectively (Table 4). The Glasgow outcome score was not measured in all three studies. There are, however, no patients surviving in a persistent vegetative state. The case fatality rate for extradural haematoma was 20% and subdural 67% (Table 5). Diffuse brain injury was diagnosed either at operation or on autopsy in the absence of CT scanning. In practice a fractured base of skull in association with a GCS of 3-5 also denotes diffuse brain injury unless the patient makes a rapid recovery in the first 24 hours. The fatality rate in these patients was 100% (Table 5). The 9 deaths which occurred due to concurrent injuries (Table 5) were all from abdominal injuries. 2 patients died of infection complicating open depressed fractures (Table 5).

Discussion

These are the only studies of head injury so far performed in PNG although deaths from head injuries have been reported in studies of surgical and trauma deaths (1,5). The outcome from severe head injuries in Papua New Guinea is similar to that in other developing countries. The fatality rate of 81% for cases with a GCS of 3-5 on admission is a little

TABLE 1

THE AGE AND SEX OF HEAD INJURY ADMISSIONS IN PORT MORESBY AND GOROKA

Place	Year	Head injuries	Males	Females	Adults	Children <12 years
Port Moresby	1984-1985	60	48	12	49	11 (18%)
Goroka	1988-1991	106	74	32	77	29 (27%)
Port Moresby	1992-1993	108	73	35	70	38 (35%)
Total		274	195	79	196	78 (28%)

TABLE 2

CAUSES OF HEAD INJURY ADMISSIONS

Place	Year	MVAs	Assaults	Falls	Others	Total
Port Moresby	1984-1985	34	17	7	2	60
Goroka	1988-1991	60	25	19	2	106
Port Moresby	1992-1993	40	47	21	0	108
Total		134 (49%)	89 (32%)	47 (17%)	4 (1%)	274

MVA = motor vehicle accident

TABLE 3

DEATHS FROM HEAD INJURY

Place	Year	Patients	Deaths	Percent	Avoidable
Port Moresby	1984-1985	60	17	28%	2 (12%)
Goroka	1988-1991	106	26	25%	2 (8%)
Port Moresby	1992-1993	108	14	13%	2 (14%)
Total		274	57	21%	6 (11%)

TABLE 4

MORTALITY AND GLASGOW COMA SCORE (GCS) ON ADMISSION

GCS	Port Moresby	Died	Goroka	Died	Total deaths
3-5	12	11	14	10	21 (81%)
6-8	8	1	11	3	4 (21%)
9-15	88	2	41	2	4 (3%)

TABLE 5

HEAD INJURY PATHOLOGY AND DEATHS

Pathology	Port Moresby 1984-1985	Goroka 1988-1991	Port Moresby 1992-1993	Total	Deaths
Open depressed	7 (1)*	8 (0)	8 (1)	23	2 (9%)
Closed depressed	0	1 (0)	12 (0)	13	0
Extradural	5 (1)	2 (0)	3 (1)	10	2 (20%)
Subdural	5 (3)	11 (8)	5 (3)	21	14 (67%)
Diffuse injury	12 (12)	14 (14)	10 (10)	36	36 (100%)
Associated injuries	11 (5)	24 (2)	31 (2)	66	9 (14%)

*Number of deaths is given in parenthesis

better than the 92% reported from Zambia where head injuries were also managed by general surgeons without CT scanning (3). Patients with a GCS of 6-8 had a mortality of around 20% in Zambia as well as in PNG. These results are similar to those from Leicester, UK (8) with 76% and 41% and Kota Bharu, Malaysia (4) with 72% and 33% mortality respectively for GCS 3-5 and 6-8. In both Leicester and Kota Bharu, Malaysia, head injuries were also managed by general surgeons but they had both CT scanning and mechanical ventilation readily available. Also, in both Papua New Guinea and Zambia, intensive and surgical ward care was not good enough to enable the vegetative to survive. To some extent this may be fortuitous in that those who would have survived might be severely dependent individuals. However, it also suggests that there is some unnecessary morbidity and mortality due to inadequate inpatient management. In some cases we have missed haematomas and the low autopsy rate of 26% means we may not always learn from our mistakes.

In 1993 head injury caused 38 of 118 trauma deaths (32%) outside hospital in Port Moresby. The commonest cause of head injury was MVA, which accounted for 27% of these deaths. Head injury was also responsible for 60% of trauma deaths occurring in hospital and 30% of all surgical deaths (9,10). Motor vehicle accident deaths were due to head injury in 543 of 1286 cases (42%) over the 10 years from 1976 to 1985 (5). Although motor vehicle accidents were the commonest cause of head injury in Goroka this was not so in the Southern Highlands town of Mendi, where assault and tribal fights accounted for two-thirds of head injury admissions (2). Tribal fight head injuries are usually due to arrow wounds. In some parts of PNG falling from trees or falling coconuts are common causes also (11).

Most deaths from head injury occur because of the severity of primary brain injury. Prevention is therefore the only way of reducing these deaths. The number of head injuries occurring as a result of MVAs could be reduced by a number of interventions. First, wearing seat belts, which has been law for some years now (12), should be enforced. Second, driving under the influence of alcohol should be stopped. Studies have shown that there is a high frequency (over 30% at weekends) of driving under the influence of alcohol but there is no use of breathalysers in PNG (13). Third, those riding unprotected in open-backed utilities should be protected by roll-bars or cages (14). Pedestrians are also at greater risk in urban areas because of the lack of street lights and pavements, and, in one study of fatalities, because they were usually drunk (1).

Secondary brain injury can be minimized by aggressively treating hypoxia and hypotension in the emergency receiving area of our hospitals. The Early Management of Severe Trauma (EMST) Course is designed to teach basic trauma care and has a strong emphasis on airway management and shock. The first such course was held in Port Moresby in 1993. It is hoped that the course will become an annual event from 1996.

Those patients who will benefit from diagnostic craniotomy should be identified early and transferred straight to theatre. Emergency craniotomy is indicated for those who are deteriorating, those who are unconscious with neurological signs (unilateral dilated pupil or hemiplegia), those who are unconscious but who had a lucid interval and those with an open depressed skull fracture. A CT scanner would improve our selection of cases for burr holes, give a better picture of the actual pathology, and help with those patients who fit, fail to improve or deteriorate after surgery. Its introduction has been advocated by our visiting neurosurgeons (15) but lack of funds has prevented a CT scanner being included in the 1996-2000 National Health Plan. Earlier CT scanning would certainly help to reduce the mortality of extradural haematoma (20%) and would be of diagnostic benefit for another 5-10 head-injured patients per year in Port Moresby. This would not justify the recurring costs of maintaining the service given the current economic crisis.

Other causes of secondary brain injury such as cerebral oedema require better intensive care nursing and better control of ventilation with monitoring of oxygen saturation and blood gases. Infection in the form of brain abscess or meningitis can only be minimized by prophylactic antibiotics and early, thorough debridement of wounds. These points are emphasized in the teaching programs of the Department of Surgery.

Head injuries are an important issue not only for the Health Department but also for the Transport Department and Police since the commonest causes are assault and motor vehicle accidents. Reducing the morbidity and mortality of head injury will require action from the community, police and politicians, who must strive to reduce the incidence of trauma and head injuries. The role of the surgeon is to minimize secondary brain injury from hypoxia, hypotension, haematoma, hypoglycaemia, oedema and infection as well as to participate in public education and preventive programs.

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